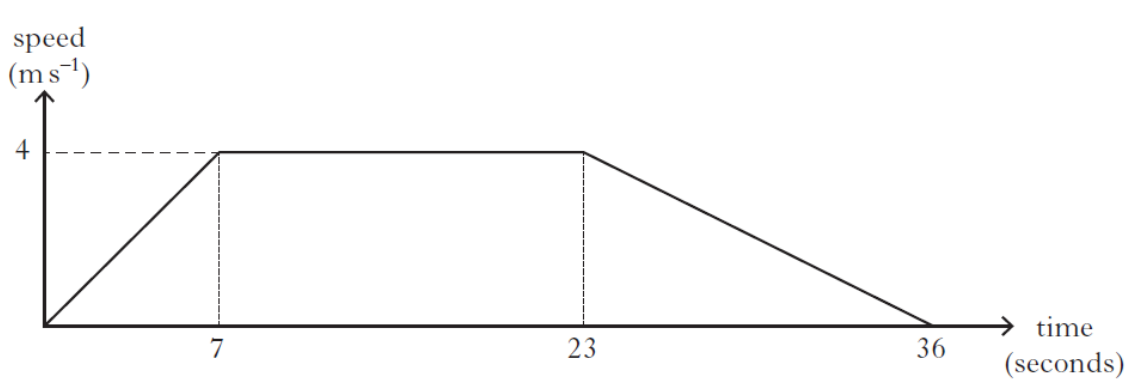


Power

2005 SP	<p>3. A train of mass 80 tonnes is travelling at a constant speed of v metres per second along a straight, level track against a resistance whose magnitude is $200v$ newtons. Given that the power at which the train's engine is working is 80 kW, find the speed of the train.</p> <p>What increase in power will be required for the train to maintain the same constant speed up a hill, inclined at $\sin^{-1} \frac{1}{240}$ to the horizontal, against the same resistance?</p>	2 3
2007	<p>A6. A car of mass 1400 kg travels with constant speed, $V \text{ m s}^{-1}$, along a straight, horizontal stretch of road. A constant resistive force of magnitude 500 newtons acts on the car. The engine of the car is working at a rate of 15 kW. Calculate the value of V.</p> <p>When the car travels up a slight incline of θ° to the horizontal, its speed, which is again constant, is $\frac{1}{2}V \text{ m s}^{-1}$. Assuming that the resistive force remains the same as before and that the engine continues to work at a rate of 15 kW, calculate the value of θ.</p>	2 4
2008	<p>A5. Ben is cycling up a straight road which is inclined at an angle θ to the horizontal where $\sin \theta = \frac{1}{20}$. The combined mass of Ben and the cycle is 100 kg. The resistance to the motion from non-gravitational forces is a force of magnitude kv^2 newtons, where $v \text{ m s}^{-1}$ is the speed of the cycle and k is a constant.</p> <p>When Ben is cycling up the road at 2 m s^{-1}, his acceleration is 0.05 m s^{-2} and the rate at which he is working is 120 W.</p> <p>Calculate the value of the constant k.</p>	6
2013	<p>A4. A go-kart of mass 100 kilograms accelerates at 3 m s^{-2} at the instant when its speed is 5 m s^{-1} and the engine's power is at a maximum.</p> <p>Given that there is a total resistance to motion of 60 newtons throughout the go-kart's motion, find the maximum speed which the go-kart can achieve.</p>	4
2015	<p>A4. A lift and its occupants are limited to a mass of 1800 kg. It is to be drawn up and down a lift-shaft by an engine, using an inextensible cable.</p> <p>A speed/time graph for the lift's ascent is shown.</p>  <p>(a) Find the power of the engine when the lift is fully loaded and travelling with a constant speed.</p> <p>(b) Find the maximum power generated during the ascent.</p> <p>(c) Find the vertical distance travelled by the lift.</p>	2 2 2

2016 SP	<p>3. A cyclist climbs a hill of length 2.4 km and constant gradient 1:25 in 12 minutes. When cycling at a constant speed of $v \text{ m s}^{-1}$, the external resistances to motion are $(10.5 + 0.4v^2) \text{ N}$.</p> <p>Given that the total mass of the cyclist and bike is 66 kg, calculate the power produced by the cyclist.</p>
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